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# SOUTH BAY SIX DRIVE-IN THEATRE

# LANDFILL GAS CONTROL SYSTEMS

## OPERATION, MAINTENANCE, AND MONITORING MANUAL



PREPARED FOR:

SYUFY ENTERPRISES

DECEMBER, 1981

PREPARED BY:

SCS ENGINEERS



P 3 following This page shows gas well location

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DRAFT FINAL

# SOUTH BAY SIX DRIVE-IN THEATRE LANDFILL GAS CONTROL SYSTEMS OPERATION, MAINTENANCE, AND MONITORING MANUAL

Prepared for:

Syufy Enterprises
150 Golden Gate Avenue
San Francisco, California 94102

Prepared by:

SCS Engineers
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December 1981

# SECTION 2

# OPERATION, MAINTENANCE, AND MONITORING INSTRUCTIONS

## 2.1 PERIMETER LFG CONTROL SYSTEM

### 2.1.1 System Description

The perimeter LFG control system was installed to control the migration of LFG to adjacent properties. The system consists of the following components:

- A series of 19 gas extraction wells installed around the perimeter of the site, as shown on Figure 2. Each well is connected to a 4- to 6-in-diameter PVC collection header.
- Several moisture traps located along the collection header to remove moisture condensed from the extracted LFG. The approximate location of each moisture trap is shown on Figure 2.
- A gas extraction blower and appurtenant equipment (see Figure 3) located in the blockhouse adjacent to Francisco Street.

The blower extracts LFG from each of the wells via the header piping. The extracted gas is then flared on site (see Figure 4).

### 2.1.2 System Operation

The following procedures describe the operation of the perimeter LFG control system. Operation of this system may require coordination with operation of the interior system (see Section 2.2.2). The standard operational procedure will assure that the interior system is operating, and that the flare flame has been established before the perimeter system is started.

#### 2.1.2.1 Initial Start-Up--

- Open control valves at each perimeter extraction well (see Figures 5A and 5B).
- Fully open control valve in the inlet header at blower location (see Figure 6A).

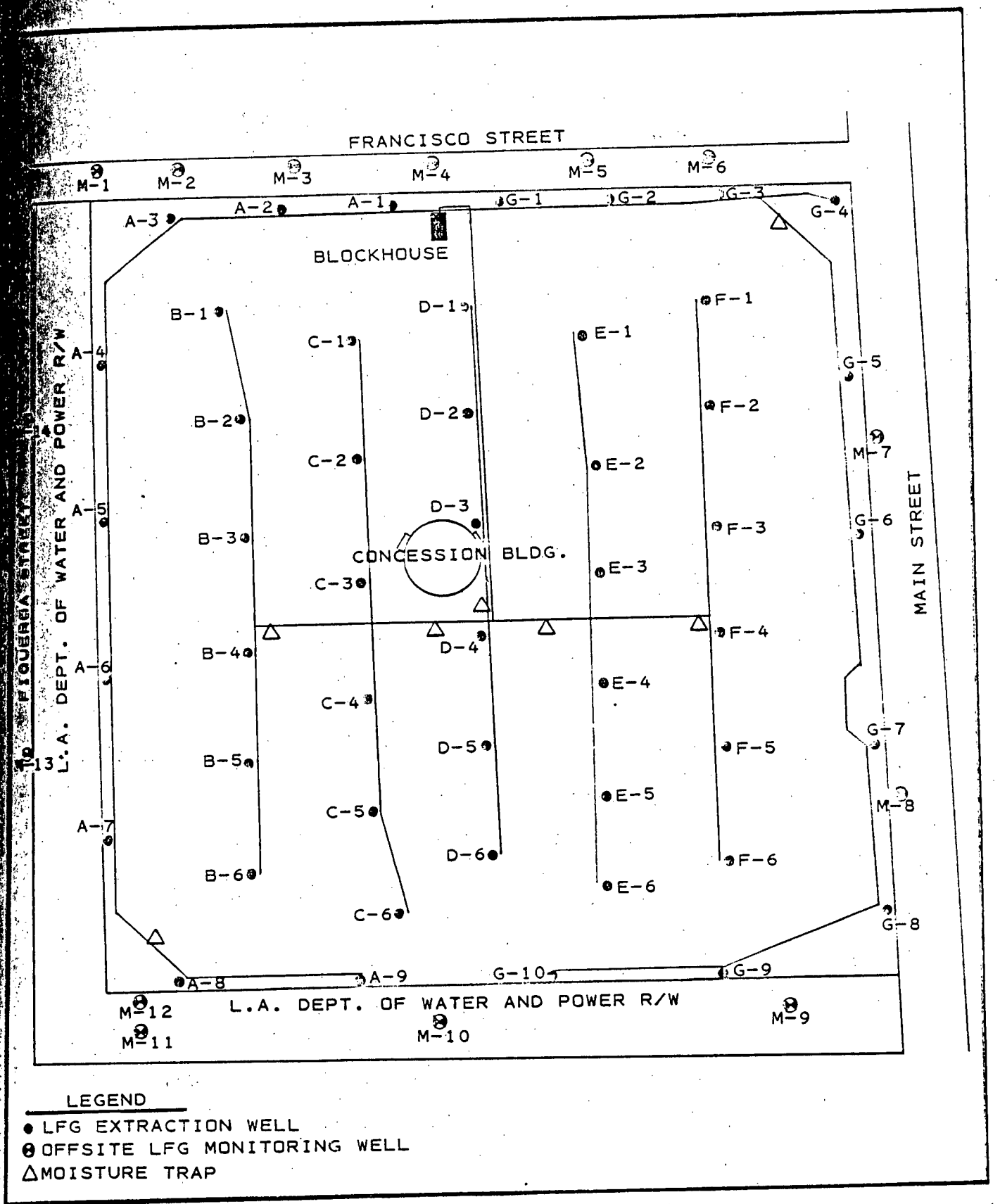


Figure 2. Site plot plan.

SUP. 118

# FINAL REPORT OF REVIEW OF ENGINEERING DRAWINGS AND REPORTS FOR LANDFILL GAS CONTROL FACILITIES AT PROPOSED SOUTH BAY SIX DRIVE-IN THEATRE

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S.U.P. NO. 118-74

PREPARED FOR

CITY OF CARSON, CALIFORNIA

SEPTEMBER 1977



ENGINEERING-SCIENCE, INC.
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26 September 1977

City of Carson
701 East Carson Street
Carson, California 90749

Attention: E. Frederick Bien, Administrator

Subject: South Bay Six Drive-In Theater
Landfill Gas Control (2532)

Gentlemen:

Transmitted herewith for your information are twenty copies of "Final Report of Review of Engineering Drawings and Reports for Landfill Gas Control Facilities at Proposed South Bay Six Drive-In Theater".

Among the few items of concern remaining are the potential consequences of differential settlement and gas control involved with discrete components of the utilities and certain elements of the gas control system operations. These matters are discussed in the report.

This opinion is furnished as required by an agreement of 7 February 1977, with you, and is based upon information available to us which has been referenced in the enclosed report.

Very truly yours,

M. E. Nosanov
Associate and Chief
Civil Engineer

MEN:ck
Enclosures

- The air pump and appropriate piping will be stored at the site to assure equipment availability.

- Once installed, the air pump would be used to introduce a low pressure, low volume air flow beneath the slab, thereby creating a positive pressure barrier to landfill gas accumulation beneath the building.

This air supply system would be operated continuously.

Page 9, City Consultant's Evaluation: . . ."During that time, some of the odor producing gases which are heavier than air are cause for concern in concentrations as low as parts-per-million. For example, the molecular weight of hydrogen sulfide at 34 is approximately 17 percent heavier than that of a typical mix of landfill gases or of air."

Response: The density of the landfill gas (at standard temperature and pressure) exiting the vertical vent pipes (assuming the gas extraction system is shut down for maintenance), is less than that of air. The addition to landfill gas of as much as 50 ppm of hydrogen sulfide would not significantly affect landfill gas density, nor would it render the gas more dense than air. Since gases which are mixed do not disassociate, there would be no tendency for landfill gas, or any component of the gas, to descend from the vertical vent pipe locations to ground level.

It should also be noted, that under normal circumstances, the extraction system will cause aerobic conditions to prevail beneath the building slab and in the uppermost layers of the soil overlying the refuse. These aerobic conditions would oxidize any hydrogen sulfide or similar gas being generated within the refuse materials themselves, should that gas travel through the aerobic zone.

We have experience with similar vent systems wherein vertical vents have been placed directly in refuse. These are venting landfill gas to the atmosphere approximately 8 ft in the air at the Marketplace in Long Beach, and have never been a cause for complaint or concern.

Page 10, City Consultant's Evaluation: "The present location of the existing Cincinnati blower is not indicated. The proposed location at the northeast corner of the site is indicated on Detail 2/G-4 of the Gas Control Facilities Plans. The detail showing the existing Cincinnati blower and its proposed location does not specify an explosion-proof motor. This should be shown on the drawing. Operational characteristics of the existing Cincinnati blower are not shown; e.g., capacity, total pressure, and voltage requirements."

Comment (17) is clearly self-explanatory and comments (1) and (5) are merely detail drafting items.

The responses to Comments 2, 3, 4, 6, 8 through 16, and 18 are acceptable at this time. Further changes could warrant reinvestigation of these items.

Recommendations

It is recommended that the matters referred to herein above be resolved either prior to, or as a condition of, approval.

The following recommendations are also offered:

(1) Normal settlement at the surface above the landfill is expected to contribute to the proliferation of cracks in pavement at the surface. These cracks of varying widths may vent gas in combustible concentrations, but normally only at the very surface. To prevent this occurrence, special care must be taken. The pavement surfaces should be inspected daily and continually maintained to be free of cracking. Periodic inspection of all conduit or pipe borne utilities is also recommended.

(2) A "Report of Proposed Monitoring and inspection" should be prepared by the developer and approved by the City prior to issuance of a permit to occupy. Reports of inspection should be filed with each periodic gas control monitoring report.

(3) The theater should be closed to the general public for any purpose during any period of time when hazard prevails at the site. The condition of hazard should be defined by the developer for approval by the City, in the "Report of Proposed Monitoring and Inspection".

(4) All in-ground probes shown on existing drawings presently proposed for monitoring should be removed from the existing drawings and be shown in the "Report of Proposed Monitoring and Inspection".

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DALLAS E. WEAVER, PhD., PE

Proposal to the Rams for Football Stadium.

(Some promoter) (fell through).

Redevelopment agency build the facility and lease to Rams. (at our expense).

April 27, 1977

MEMO TO: Mr. Jack Haig
Syufy Enterprises

FROM: Robert Stearns
SCS Engineers

SUBJECT: Information on Commercial Developments on Sanitary Landfills

## INTRODUCTION AND PURPOSE

The following information provides a brief summary of commercial developments in Los Angeles County known to be on, or adjacent to, completed refuse disposal sites, and presents a perspective on the methane gas control problem at the proposed Carson Six Drive-In Theatre. The information has been compiled as evidence of the safety and feasibility of such developments, and to provide additional insight into methods currently in use to successfully control hazards associated with methane gas.

Note

## COMMERCIAL DEVELOPMENTS ON OR ADJACENT TO LANDFILLS

Table A provides information on a total of 25 commercial developments, 16 of which are located immediately on or at least partially on a completed refuse disposal site. The remaining 9 developments are located adjacent to a completed refuse disposal site.

A recent article appearing on page 6, Part II of the March 22, 1977 Los Angeles Times provides further evidence of the feasibility and safety of constructing facilities on completed fills. The enclosed article reports on a new 78,000-seat stadium, part of a $342 million sports and recreation complex located in New Jersey built on the site of a former refuse disposal site. The facility includes a parking lot for 22,000 cars built directly on the refuse fill. No methane control features are included in this facility, and no problems have been reported.



concrete slabs, a possibility. ...fill and around Carson which ... are former dumpsites, but ... items to prevent any gas ... leakage to the surface.

No problems have been reported with regard to methane gas at any of these developments even though the methane control system employed (with the exception of two sites) consists of either a single plastic membrane layer located beneath the floor slab with passive roof vents, or a gas interceptor trench with passive venting.

These methods must be considered rudimentary when compared with the control systems proposed for implementation at the Carson drive-in theatre site. Furthermore, at one location in the city of Carson a restaurant built on a disposal site is not known to have any methane gas protection and yet no incidents have been reported. In addition, many of these developments have parking areas (often heavily utilized: e.g., Alpine Village, Six Plex Theatre, etc.) located on the surface of the disposal site with no provisions for methane gas protection. Yet no problems have been encountered with regard to ignition of methane gas on the site surface.

For comparative purposes the sophisticated components of the gas control system proposed for the South Bay Six Drive-In Theatre are reiterated below. The proposed system provides redundancy and is far superior and more extensive than any of the methane control systems installed to protect the listed developments. To our knowledge, it represents the most extensive system proposed for installation in any location in the world today. In the words of Mr. John Pacey, a well known expert in methane gas control, the "design proposed is substantially in advance of the current state of the art. . ."

## PROPOSED PROTECTION SYSTEM FOR DRIVE-IN THEATRE SITE

### Concession Building

- An engineered compacted soil fill 5 ft thick beneath the building foundations;
- A 6-inch gravel layer placed between the soil fill and the floor slab;
- A 10 mil plastic membrane placed over the gravel layer;
- A 2 inch sand layer;
- A 36 mil reinforced Hypalon membrane placed over the sand layer;

concrete slabs, a possibility which concerned the coun- | in and around Carson which are former dumpsites, but the ones emitting methane | tems to prevent any gas leakage to the surface. Except for some memb-

TABLE A (continued)

| Site | Location | Refuse Type | Commercial Developments | | County Methane Contro |
|---|---|---|---|---|---|
| | | | On-Site | Off-Site | |
| ✓ Alpine Village Gardena Valley Dump #4 | 800 W. Torrance Bl. Torrance | Class II | Parking Lot | Alpine Village Market and Restaurant | 10 mil Polyeth Membrane Intercept Tren & Vents |
| L. A. Co. San. District #1 | Crenshaw Blvd. Palos Verdes Estates | Class I | -- | Lincoln Property Estates | Intercept T & Vents |
| City Dump & Salvage | 6363 Pacific Coast Hwy. Long Beach | Class II | Parking Lot | Six Plex Theatre | Intercept Tren & Vents |
| ✓ BKK Dump | 19200 S. Main Carson | Class II | Golden Bull Restaurant Dominguez (piles) Golf Course | -- | None Known |
| Scholl Canyon L. A. Co. San. District #6 | Glendale | Class II | Ball Park No Buildings | -- | None Known |
| Alameda St. Dump | 22700 S. Alameda Carson | Class II | Trap & Skeet Range Clubhouse | -- | Rubbish U r Structure Rep by Earth Fill |
| ✓ Adams Industries | 213th & Dolores | Class II | Imperial States Trailer Park Swimming Pool Community Buildings | -- | Burning of Ex Gas PVC Membr Over Gravel |

TABLE A (continued)

| Site | Location | Refuse Type | Commercial Developments On-Site | Commercial Developments Off-Site | County Methane Contr |
|---|---|---|---|---|---|
| ✓ Gardena Valley Dump #6 | 213th & Chico St. Carson | Class II | -- | Ramada Inn | Yes PVC Membrane |
| ? | Watt Industries Carson | Unk | -- | Park Plaza El Camino Plaza | Intercept[illegible] 10 Mil PVC Me |
| Palos Verdes Landfill #1 | 26401 Crenshaw Rolling Hills | Class I | Rolling Hills Estates Municipal Stables | -- | Yes |
| Kalico No. 1 & # Kobra Dump | 11211 Greenstone Santa Fe Springs | Class II | Partially on Site McKelvey & Silvey Trucking | | 10 mil Polyet Gravel Unders w/Wall Vents Roof |
| Azusa Western | 1201 W. Gladstone Azusa | Class II | Extraction System | Southwestern Cement, Compressor & Dehydration Plant | PVC Membrane & Collector P for Extractio Utilization |
| Bishop Canyon Landfill | 929 Academy Dr. Los Angeles | Class II | -- | City of L.A. Restroom Facility | None Vented Buildi |
| Sheldon Arleta Pit | 8700 Arleta Ave. Sun Valley | Class II | -- | Buildings Existed Before Landfill | Methane Extra on Site |
| ✓ Alpine Village Complex Gardena Valley Dump #4 | 800 W. Torrance Bl. Torrance | Class II | Parking Lot | Heimat Haus Building | 10 mil Polye Membrane Intercept Tr & Vents |

concrete slabs, a possibility ... the coun- ... in and around Carson which ... are former dumpsites, but ... tems to prevent any gas ... migrating methane ... leakage to the surface. ... for some memb-

TABLE A

| Site | Location | Refuse Type | Commercial Developments | | County Methane Control |
|---|---|---|---|---|---|
| | | | On-Site | Off-Site | |
| Salvage Corp. | 7100 E. Gage Commerce | Unk | General Felt Industries Foam Rubber Factory | -- | Monitoring Sys |
| Russel Moe Co. | Lopez Canyon Rd. San Fernando Valley | Class II | Fireball Industries New Annex | Old Building | Ventilati Pi PVC Membrane Monitor Probes |
| ✓ Gardena Valley Dump #6 | 213th & Chico St. Carson | Class II | -- | Carson-Dominguez Industrial Park | Gravel Interce Trenches |
| Cerritos Land Reclamation Project | 20000 S. Bloomfield Ave., Cerritos | Class II | Cerritos Regional Park Tennis Complex Group Picnic Area | All Other Associated Buildings | PVC Membrane |
| Revue Studios | 100 Universal City Plaza Universal City | Class II | MCA Tour Complex | -- | Polyethylene M brane |
| ✓ Gardena Valley Dump #1, 2 Adjacent to South Western Conservation Dump | S. E. Corner of Del Amo and Figueroa Carson | Class II | Inland Pacific "Mini Storage" | Most of Development Off-site | PVC Membr e |
| Kalico Dump #1 Kalico Dump #3 Kobra Dump | 12848 Imperial Hwy. Santa Fe Springs | Class II | -- | Gotham Industries | Travel Trench Monitor Probes |

TABLE A (continued)

| Site | Location | Refuse Type | Commercial Developments | | County Methane Contro |
|---|---|---|---|---|---|
| | | | On-Site | Off-Site | |
| L. A. Co. San District #1 | Crenshaw Blvd. Palos Verdes Estates | Class II | Botanic Garden & Associated Building | -- | PVC Membrane & Vents Under On Greenhouse |
| BKK Dump | 19200 S. Main Carson | Class II | Victoria Golf Course Clubhouse | -- | None Known |